REMARKS

Applicant replies to the Office Action mailed on October 4, 2006, with a two (2) month extension of time. Claims 1-10 were pending in the application and the Examiner rejects claims 1-10. Support for the amendments may be found in the originally-filed specification, claims, and figures. No new matter has been introduced by these amendments. Reconsideration of this application is respectfully requested.

Yoshiaki Arata (the owner by assignment of U.S. Utility Patent Application No. 10/530,982) hereby requests that the entity status be changed from "large entity" to "small entity" in the U.S. Patent and Trademark Office records. At no time has there been deceptive intent. On October 11, 2005, the above -referenced application was filed and an assignment from Yoshiaki Arata to Osaka Industrial Promotion Organization (which is a large entity) was recorded (Reel 016636, Frame 0506). On May 19, 2005 an assignment from Osaka Industrial Promotion Organization to Plasma Giken Co., Ltd. (which is a large entity) was recorded (Reel 017644, Frame 0380). On October 30, 2006 an assignment from Plasma Giken Co., Ltd. back to the sole inventor, Yoshiaki Arata, was recorded (Reel 018453, Frame 0357). Since that time, the application has not been assigned or licensed the application to a large entity.

The Examiner objects to the photographs and drawings (Figures 1 and 3-11) because the Examiner believes that the photographs and drawings are color photographs and color drawings . Applicant asserts that the photographs and drawings are NOT color photographs and color drawings; rather, the photographs and drawings are simply black and white photographs and drawings. Applicant also asserts that the photographs of Figure 5 are appropriate under 37 CFR 1.84(b) because the photographs are the only practical medium for illustrating the claimed invention.

The Examiner next asserts that the incorporation of essential material in the specification by reference has been done improperly. Applicant respectfully traverses this objection.

The Examiner has objected to the improper incorporation of references into the specification, as foreign applications or patents, and publications are not allowable. Specifically, Materials Transaction, JIM, Vol. 35, No. 9, pp. 563-575, 1994; Japanese Laid-Open Publication No. 2002-105609; and Japanese Patent Application No. 2003-340285. Therefore, the Examiner asserts that the specification is not enabled. The Examiner requests that the disclosure be amended to include the above-mentioned material intended to be incorporated by reference. Specifically, the Examiner would like the following issues addressed by the proper incorporation of these references:

(A) the "conventional established theory" of solid-dissolving deuterium in metals (page 3);

(B) the "phenomenon that elasticity emerges in the bond between atoms of the material" (page 8); and

(C) the methods of preparing the metal nano-ultrafine particle (page 9).

Regarding (A), Applicant asserts that, contrary to the Examiner's assertion, the "conventional established theory" of solid-dissolving deuterium in metals is not a concept or method critical or essential to the practice of this invention. Page 3, last paragraph states that "the present inventors disproved a conventional established theory... the number of deuterium atoms/the number of palladium atoms... cannot exceed 100%". Logically, a theory that has been disproved by an invention cannot be critical or essential to the practice of this invention. Accordingly, Applicant does not believe that Applicant should be required to amend the disclosure.

Likewise, regarding (B), Applicant asserts that, contrary to the Examiner's assertion, "the phenomenon that elasticity emerges in the bond between atoms of the material", is not crucial to the working of the invention, and should not play a role in the determination of enablement. The Examiner quotes that the first paragraph of 35 U.S.C. § 112 which states that "the specification shall contain a written description of the invention, and of the manner and process of making and using it...". As such, if the specification describes the invention, and how to make and use the invention, it should not be rejected for enablement simply because there is an assertion that no explanation is given to the theory behind the working of the invention. Understanding the reason how a particular invention works is not the requirement, rather how to work it is the requirement. As such, the explanation of (B) is not a critical or essential part of enabling the invention. Accordingly, Applicant does not believe that Applicant should be required to amend the disclosure.

Regarding (C), as suggested by the Examiner, Applicant amends the specification at paragraph [0037] to include the material incorporated by reference. Applicant states that the material being inserted is the material previously incorporated by reference and the amendment contains no new matter, pursuant to 37 CFR 1.57(f). Applicant also includes herewith an English translation of Japanese Laid-Open Publication No. 2002-105609.

The Examiner also objects to the specification under 35 U.S.C 112, first paragraph, because concepts and methods critical or essential to the practice of the invention are not enabled by the disclosure. The Examiner also objects to the specification under 35 U.S.C 112, first paragraph, as failing to comply with the enablement requirement. The Examiner next rejects claims 1-10 under 35 U.S.C 112, first paragraph, as based on disclosure which is not enabling. Applicant respectfully traverses these objections and rejection.

The Examiner asserts that the specification is not enabled because it does not describe the subject matter of the invention in such a way as to enable one skilled in the art to which it pertains, or which it is most nearly connected, to make and/or use the invention, because the concepts disclosed therein are counter to the current understanding of quantum physics, with no explanation given to resolve these conflicts.

Specifically, the Examiner raises the following technical questions:

(a) how are the deuterium atoms brought within 0.6 Angstroms or less by associating with the metal atoms;

(b) how does "$^{2}D + {}^{2}D = {}^{4}He$ + lattice energy (23.8 MeV)" reaction proceed:

(c) how is the Coulomb barrier overcome; and

(d) how are the deuterium nuclei brought to within distances within the interaction radius of the strong nuclear force but remain un-fused until the application of additional energy?

The Examiner also asserts that:

(e) the preferred "$^{2}D + {}^{2}D = {}^{4}He$ + lattice energy (23.8 MeV)" reaction stated in the specification have a vanishingly small probability of occurring:

(f) no single deuterium-deuterium nuclear fusion reaction generates tritium and neutrons as suggested on p. 21, paragraph [0091) of the specification; and

(g) the high pressure gas other than helium that is produced is not identified.

Regarding (a)-(d), Applicant asserts that all this is possible due to the nature of the nano-ultrafine particles, including the elasticity in the bonds of the particles when reduced to a particular size. The nano-ultrafine particles allow hydrogen isotope atoms to be dissolved within the atomic gaps of the particles to distances equal to or smaller than the internuclear bonds between the same two types of hydrogen isotope atoms as a single molecule.

Regarding (e), Applicant asserts that the reaction proceeds in a very different manner than the usual method of deuterium-deuterium reactions, and as such, results in this particular

reaction being favored. In conventional deuterium-deuterium fusion, reactions take place by the collision of atoms at velocities high enough to overcome the Coulomb barrier. However, in the present invention, the atoms are not collided with each other, and are instead packed together within the nano-ultrafine particles by a combination of increased atmospheric pressure and the elastic bond energy of the nano-ultrafine particles. It would be logical to assume that because the nature in which the atoms are brought together to fuse is so different from conventional random collision means, that it would be possible to specifically favor the "$^2D + {}^2D = {}^4He +$ lattice energy" reaction.

Regarding (f), as described by the Examiner on page 4 of the present Office Action, conventional deuterium-deuterium fusion reactions produce both tritium and neutrons, albeit through separate reactions. This recitation in the specification does not necessarily mean that tritium and neutrons are produced by a single reaction. Further, the plurality of the recitation of "neutrons" would indicate to one skilled in the art the process of more than 1 reaction.

Regarding (g), Applicant asserts that the "the high pressure gas other than helium that is produced is produced by the vaporization of the ultrasonic wave transfer medium, which can be H_2O, D_2O and the like. The heat produced from the fusion of the hydrogen isotope atoms vaporizes the transfer medium into D_2, D, or water vapor, as described throughout the Examples, for example, paragraph [0098].

In addition to addressing these technical questions, Applicants assert that the specification discloses how to work the invention by teaching how to obtain/use all the essential materials/methods, and that the invention actually works. Specifically, on a step-by-step basis:

(i) The subject matter of Japanese Laid-Open Publication No. 2002-105609, as now properly included in the specification, teaches the method of producing the metal nano-ultrafine particle. For example, producing $Zr0_2$•Pd which is used in Example 1.

(ii) Deuterium gas (D_2) and the method of obtaining such, is well-known to those skilled in the art.

(iii) Fig. 2 describes the construct of a reaction furnace that can be used to work the invention.

(iv) Example 1, paragraphs [0076] to [0084] provides guidance as to how to prepare the hydrogen condensate.

(v) Fig. 3 demonstrates the infusion of the deuterium gas into the metal nano-ultrafine particles. At a constant deuterium gas injection rate of 20cc/min, the pressure of the reaction furnace does not change until the 25 minute mark, and during this time, there is an increase in the temperature of the reaction furnace. As the pressure in the reaction furnace starts to increase, the temperature begins to normalize. Therefore, it is logical to assume that the temperature increase is caused by the absorption of the deuterium gas into the metal nano-ultrafine particle.

(vi) Example 1, paragraphs [0085] to [0087] provides guidance on a method for initiating the reaction between the condensed hydrogen isotope atoms by providing an initial burst of energy (in this case, ultrasonic wave energy).

(vii) Figs. 4-6, and paragraphs [0095] to [0111] illustrate the results of Example 1.

Fig 4 shows the amount of heat generated by the fusion reaction in the reaction furnace compared to the chemical reaction heat generated by solid-dissolving the deuterium gas.

Fig 5. compares the appearance of the deuterated nanoparticle sample before and after the fusion reaction. The $Zr0_2$ that was in the sample, which has a melting point of 1850°C, was melted. This indicates the temperature in the reaction furnace equaled or exceeded 1850°C.

Fig. 6A shows the analysis of gas generated during the fusion reaction. It shows that a large amount of helium was produced.

Fig. 6B shows that substantially no He or D remained in the sample

As such, the specification is clearly enabled and demonstrated to work, as all the steps and materials are clearly and unambiguously described in the specification as amended.

The Examiner rejects claims 1-10 under 35 U.S.C 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter. Applicant respectfully traverses this rejection.

More specifically, the Examiner asserts that claims 1-10 are indefinite, because a certain amount of energy should be required to practice the invention, but the claims do not recite the application of the certain amount of energy. Applicant asserts that specifying a particular amount of energy to initiate the fusion reaction would unduly restrict the invention. It is appreciated that one skilled in the art would easily be able to adjust the amount and type of energy provided to initiate the fusion reaction based on the composition of the metal nano-ultrafine particles or metal alloy composites, which would determine the spacing of the dissolved

hydrogen isotope atoms, and hence the activation energy necessary. For example, a composition which provides closer spacing would require less energy and vice versa.

The Examiner rejects claims 1, 3, 6, and 8 under 35 U.S.C. 112, second paragraph, as incomplete for omitting essential steps. Applicant respectfully traverses this rejection.

More specifically, the Examiner asserts that claims 1, 3, 6 and 8 are incomplete because the claims omit essential steps such as those involved in the condensation of the hydrogen isotope atoms, and generating heat. Further with regard to generating heat, the Examiner asserts that the claims encompass both atomic and nuclear reactions, and due to rejection (3) it is not clear that thermal energy will result from the reactants.

With regard to the steps involved in condensing the hydrogen isotope atoms, Applicant asserts that because claims 1 and 3 are directed towards "a method of generating heat using a hydrogen condensate", wherein the hydrogen condensate satisfies specific criteria, including a step regarding preparing the hydrogen condensate is not essential. Applicant further asserts that the method of preparing the hydrogen condensate is not essential, because it is the spacing of the hydrogen isotope atoms that are essential, and this directly correlates to the composition of the metal nano-ultrafine particle or metal alloy, and the dissolving of the hydrogen isotope atoms therein. As such, including the specific conditions used for a particular composition would unduly limit the claims of the invention, because different compositions would require slightly different conditions to produce a hydrogen condensate. Further, it is conceivable that based on the disclosure of the present invention, one skilled in the art would be able to slightly adjust the method for condensing hydrogen so that the interatomic spacing requirements of the independent claims are met.

With regard to the heat generating step, Applicant asserts that this is not an essential step, and is merely a result of applying an appropriate amount of energy to the hydrogen condensate, which satisfies the interatomic spacing criteria listed in the independent claims, to cause the nuclear fusion of the hydrogen isotope atoms which generates heat.

Applicant also amends claims 1, 3, 5 and 10 to clarify that the invention causes a fusion reaction which produces heat, not an chemical reaction, by replacing "react(ed)" with --fuse(d)--. Support for this amendment can be found throughout the specification, for example, paragraphs [0090-0091].

The Examiner next asserts that the recitations of "inter-atomic nuclear distance between the condensed hydrogen isotope atoms" and the "internuclear spacing of a molecule consisting of two hydrogen isotope atoms", are indefinite. Applicant asserts that such recitations are clear and unambiguous to one skilled in the art. The recitation "inter-atomic nuclear distance between the condensed hydrogen isotope atoms" clearly refers to the distance between two hydrogen isotope atoms, this distance would mainly vary depending on the metal nano-ultrafine particle or metal alloy composite used, and the number of hydrogen isotope atoms dissolved in the composite. The "internuclear spacing of a molecule consisting of two hydrogen isotope atoms" clearly refers to the distance between the nuclei of diatom molecules of hydrogen isotopes (for example: hydrogen-hydrogen; hydrogen-deuterium; hydrogen-tritium; deuterium-deuterium; deuterium-tritium and tritium-tritium), the internuclear spacing of such molecules are easily accessible to one skilled in the art, and therefore the recitation is definite.

The Examiner next asserts that claims 1-10 are not enabled because the claimed invention is not supported by either a credible asserted utility or a well established utility, and as such, one skilled in the art would clearly not know how to use the claimed invention. Applicant asserts that the utility of the invention is clearly described in the specification, and well known to one skilled in the art. This rejection seems to be based on the Examiner's opinion that the invention does not work. As such, Applicant respectfully asserts that the foregoing arguments related to the other enablement and clarity issues should address this rejection.

The Examiner rejects claims 1-10 under 35 U.S.C. 101 because the disclosed invention is inoperative and lacks utility. Applicant respectfully traverses this rejection. Applicant asserts that the foregoing arguments address this issue, so this rejection is now moot.

The Examiner rejects claims 1-3 and 6-8 under 35 U.S.C. 102(b) as being anticipated by Zaluska et al. (Appl. Phys. 2000). Applicant respectfully traverses this rejection.

More specifically, the Examiner asserts that claims 1-3 and 6-8 are anticipated by Zaluska et al. which discloses nano-crystalline metals including nickel (Fig. 4), palladium (Fig. 5), iron and titanium (p. 160, left column, 3rd paragraph), and zirconium (Fig. 7); a plurality of hydrogen isotope atoms dissolved among the metal ions (refer to Figs 1-2, 6-8 and 10); and the absorption and desorption of the metal hydrides at relatively high temperatures (Fig. 7). The Examiner contends that if the claimed steps are enabling for causing the hydrogen isotope atoms

to react with each other, and if this reaction generates heat, then it is inherent that the method of Zaluska also generates heat when energy is applied to the hydride for desorption.

Applicant asserts that this interpretation is based on the Examiner's assertion that the recitation of "smaller than or equal to an internuclear spacing of a molecule consisting of two hydrogen isotope atoms" is unduly broad. Applicant asserts that the foregoing arguments addressing the previous rejections render this rejection moot. Furthermore, this reference does not disclose the fusion of hydrogen isotope atoms to produce usable energy, and therefore cannot anticipate this invention.

The Examiner next rejects claims 4 and 9 under 35 U.S.C. 103(a) as being obvious over Zaluska et al. and admissions by the Applicant. Applicant respectfully traverses this rejection.

More specifically, the Examiner asserts that claims 4 and 9 are obvious over Zaluska et al. and admissions by the Applicant, because there is no enabling disclosure for employing the energy generating methods to working the claimed invention. The Examiner asserts that this truncated disclosure is an admission of use of a work of another and as such, can be considered prior art against the present invention. Applicant asserts that the foregoing arguments addressing the previous rejections render this rejection moot, as the independent claims would clearly be considered novel and unobvious.

Applicant respectfully submits that the pending claims are in condition for allowance. Reconsideration of the application is thus requested. The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account No. **19-2814**. Applicant invites the Examiner to telephone the undersigned if the Examiner has any questions regarding this Reply or the present application in general.

Respectfully submitted,

Dated: February 8, 2007 By: _____
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